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Welcome to the 8-bit & 16-bit Embedded Resource Catalog 2009

When high-bandwidth processors and gadgets get headlines, they are depending on 8-bit microcontrollers to deliver the news. These deceptively simple MCUs are the real wheels of commerce, infrastructure and industry. Not every application needs high levels of integration and performance. Most, especially in this economy, simply need to be done competently and inexpensively. That has been the realm of 8-bit MCUs since they were introduced in the 1970's. They are well understood, easily adapted, and thoroughly supported.

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Inside this catalog you will the data sheets and detailed ads you need to make the best decisions. There are always new products to study and new ideas to build on. As you turn the pages you will find established vendors to revisit and upstarts to thoughtfully evaluate. This is your essential guide for a successful year.

And don't forget to send your feedback, thoughts and comments to: info@extensionmedia.com

John Blyler
Editorial Director

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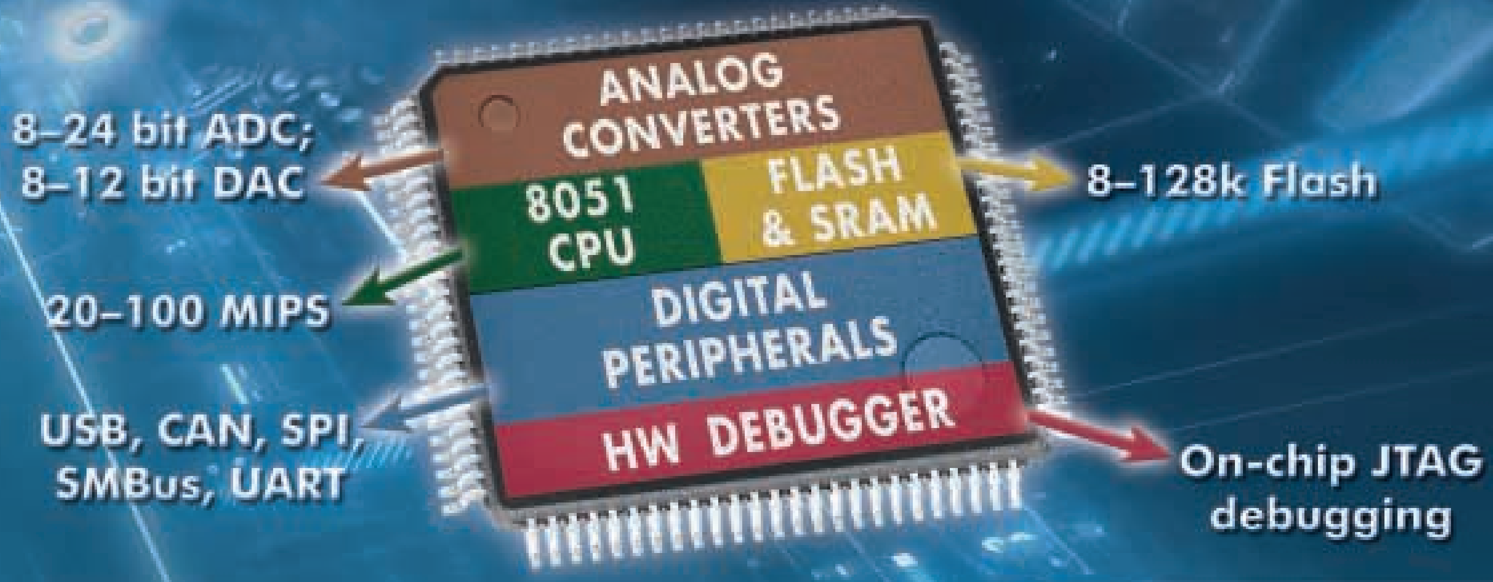
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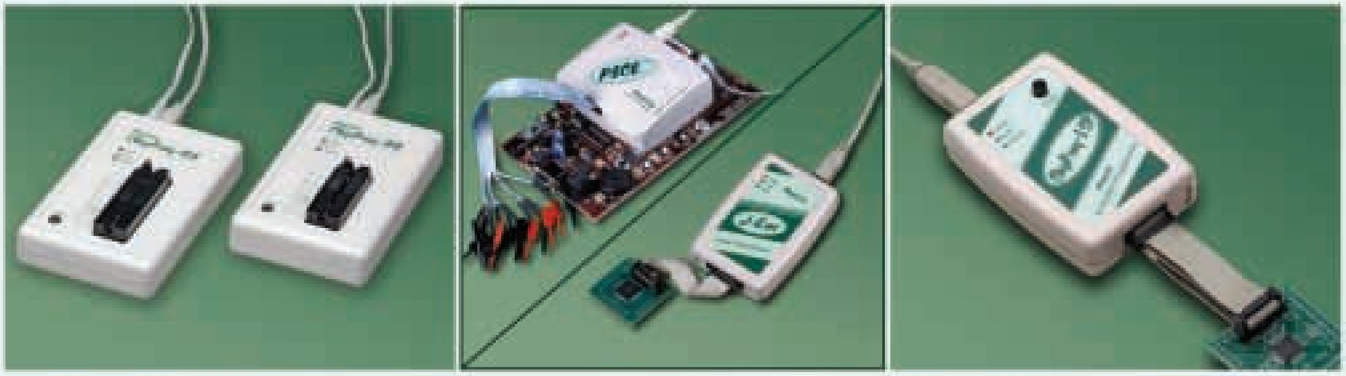

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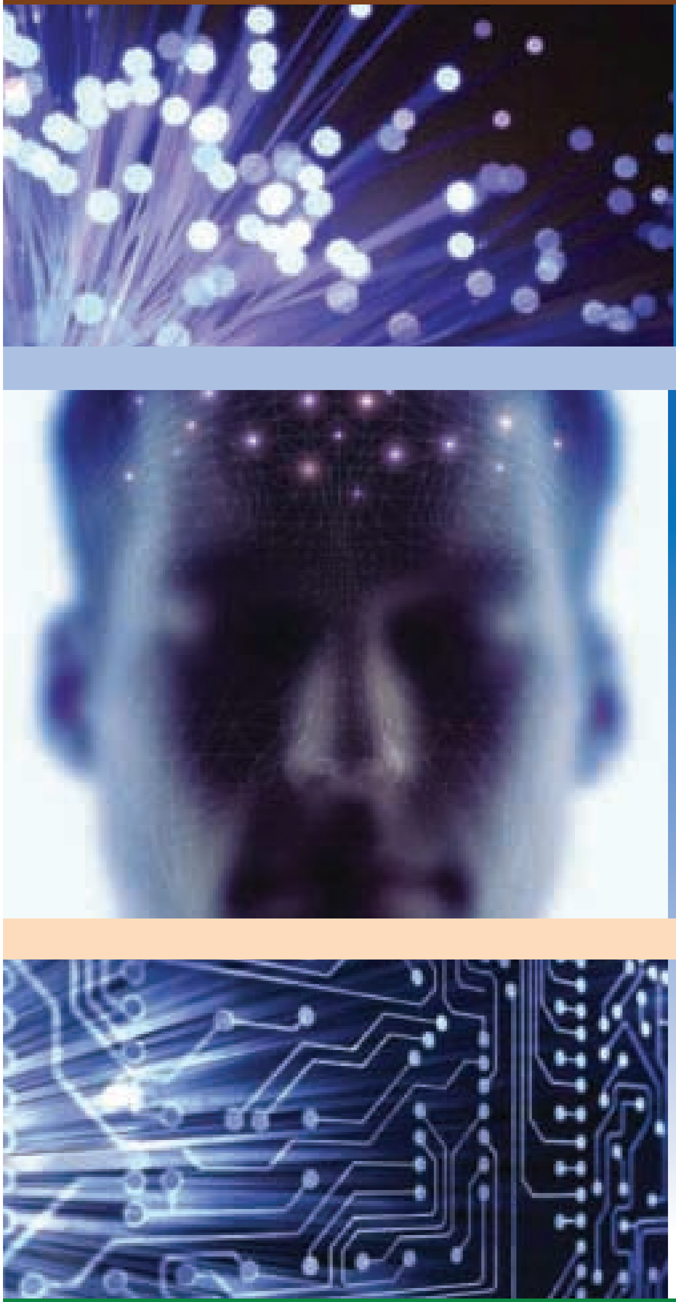

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Industry Forecast

Conflicting Requirements Drive the 8-bit Microcontroller Market

by Dave Bursky

The 8-bit microcontroller market is a complex montage of conflicting design requirements. Users want low-cost chips that deliver high levels of integration and high performance. Unfortunately, those three vectors are in direct conflict with each other. Highly integrated devices tend to have larger chip areas and thus might cost more. High-performance devices may require more advanced processes or more complex architectures, which also will result in higher costs. By looking at system costs rather than individual chip costs, however, the steeper silicon cost of a more highly integrated device can be lower than the total cost of a more discrete solution—especially when all of the manufacturing and testing overheads are taken into account.

It wasn't that long ago that the 8-bit manufacturers were trying to get the high-volume price for a low-end MCU to less than $1. Today, prices in large volumes are already less than 25 cents for some devices, states Alexis Alcott, product marketing manager for Advanced MCU Architectures at Microchip Technology Inc., Chandler, Ariz. Such low prices, she continues, allow designers to use 8-bit MCUs to replace dedicated logic and achieve a lower-cost solution that is more flexible, as software can be updated to add features to the end product without redesigning the logic. Such integration and low cost open up many new applications that previously were not considered economically viable for microcontrollers. Today, for example, liquid-crystal-display (LCD) readouts are incorporated into thermometers, pregnancy test kits, electronic tape measures, and many other products that didn't exist just a few years ago.

To reduce system costs, microcontrollers are now incorporating functions like Universal-Serial-Bus (USB) controllers, LCD controllers, Ethernet media-access controllers, accompanying physical interfaces (MACs and PHYs), and even capacitive touch controllers. Because there is no single all-in-one solution, the market for 8-bit MCUs is highly fragmented, emphasize both Alexis Alcott and Fanie Duvenhage, Microchip Technology's director of marketing and applications. Microchip, for example, offers multiple 8-bit families that address the various markets for display control communications and peripheral connectivity as well as many other market segments.

In 2008, the approximate market size for 8-bit microcontrollers totaled about $5 billion according to Amy Leong, research director for semiconductors at Gartner in San Jose, Calif. However, she expects that the tough economic conditions in 2009 will shrink the market to just under $4 billion this year. But the market will rebound slightly in 2010 and regain most of its losses in 2011. However, it will take until 2012 for the market to surpass the 2008 levels. Another market observer—Jordan Selburn, principal analyst for semiconductor design at ISuppli—states that one key trend for the 8-bit market is the integration of specialized interface blocks on the MCUs—especially USB 1.1, LCD control, and other functions that were often standalone chips in previous-generation designs.

The need for rich peripheral sets on the MCUs helps to lower system costs. But the MCUs don't necessarily need the most advanced processes to achieve the desired performance levels, explains Duvenhage. Most 8-bit MCUs are still manufactured using 0.35- and 0.25-{LC MU}m processes. That actually works well for the integration of functions like LCD controllers and USB ports because the voltages needed to drive those interfaces are easier to deal with at those dimensions. In addition, leakage currents are low. Thus, the controller vendors can deliver chips with ultra-low standby and operating currents.

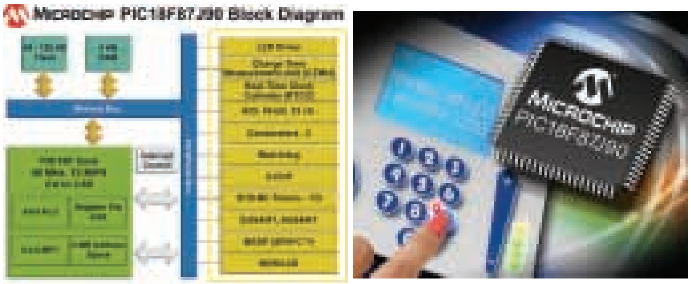

Figure 1: Sporting direct LCD control and capacitive touch sensing, the PIC18F87J90 8-bit microcontrollers pack up to 128 kBytes of Flash-based program memory, 4 kBytes of RAM, and a broad range of I/O functions including a 10-bit/12-channel ADC, a charge-time measurement unit (for the capacitive touch sensors), comparators, timers, serial ports, and more (left). The integrated LCD controller allows the PIC18F87J90 series MCUs to serve in many applications ranging from smart-phone displays and exercise systems to digital thermostats (right).

LCD displays driven by 8-bit MCUs are almost all segment-type panels because the memory requirements for dot-matrix-style displays would require more memory than most microcontrollers typically integrate. One of the latest MCU families with LCD controllers comes from Microchip. The company recently added to its existing families of 8-bit MCUs by releasing the PIC18F87J90 family. These MCUs include LCD controllers and extend the on-chip memory to up to 128 kBytes of Flash and 4 kBytes of RAM (see Figure 1). The large amount of on-chip memory is needed as program complexity continues to increase, states Alcott.

For USB applications, many MCU vendors offer 8-bit processors with USB 2.0 full-speed, USB 1.1, and a few legacy devices that still offer USB 1.0 ports. No immediate plans are in place by 8-bit vendors to offer a USB 2.0 high-speed option, as the 480-Mbit/s transfer speed would overwhelm most 8-bit architectures. Most vendors agree that such high-speed ports as well as the more complex on-the-go and embedded host features are better handled by 16- and 32-bit processor architectures.

Full-speed USB ports (12 Mbits/s) are available on a wide range of 8-bit MCUs from Microchip and many other 8-bit MCU vendors including Atmel, Freescale, Fujitsu, NEC, Silicon Labs, STMicroelectronics, and others. For example, Microchip's PIC18F8xxx and 18F6xxx devices are available in versions that can operate from supply voltages as low as 1.8 V. The on-board processor delivers 12 to 16 MIPS and on-chip memory ranges to 128 kBytes of Flash-based program storage and 4 kBytes of data SRAM. Released in late 2008 to tackle low-end USB applications, the MC9S08JM16 series from Freescale Semiconductor, Austin, Texas, is based on the company's S08 8-bit controller core. It includes a USB 2.0 full-speed interface, up to 16 kBytes of Flash, 1 kByte of SRAM, and many other control and interface functions (see Figure 2).

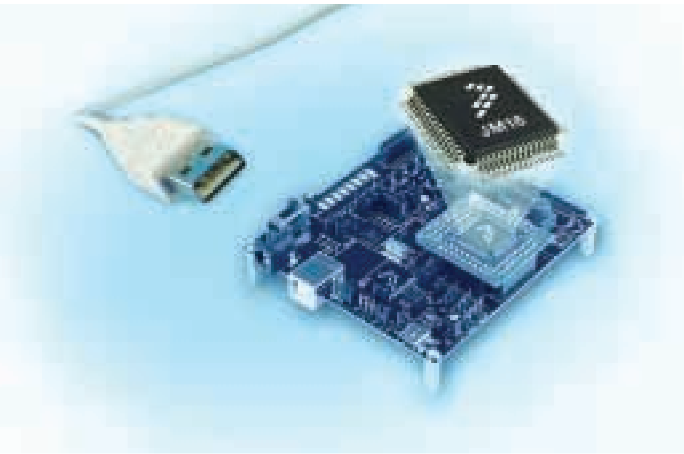

Figure 2: The MC9508JM16 MCUs are based on an S08 processor core and include a USB 2.0 full-speed interface, a 12-bit/8-channel ADC, and other peripheral functions. With a simple development board, designers can quickly create solutions for cost-sensitive markets like PC peripherals, barcode scanners, utility meters, game pads, and touch panels.

Network interfaces are a growing interest area. Many vending machines, kiosks, and numerous industrial and consumer products now have to tie into the Internet for remote diagnostics, program updates, and data-collection applications. By incorporating a full Ethernet port (10 Mbit/s) on the microcontroller, designers at Microchip, Maxim, Silicon Labs, and a few other companies can offer a complete network solution on a chip. For example, Microchip's PIC18F96J60 integrates the Ethernet media-access controller (MAC) and physical layer (PHY) as well as a 10-bit analog-to-digital converter (ADC), two UARTs, 8 kBytes of Ethernet buffer RAM, up to 128 kBytes of Flash program storage, and 4 kBytes of SRAM. Maxim includes a full Ethernet 10/100 MAC solution on an enhanced 8051 core along with many other functions.

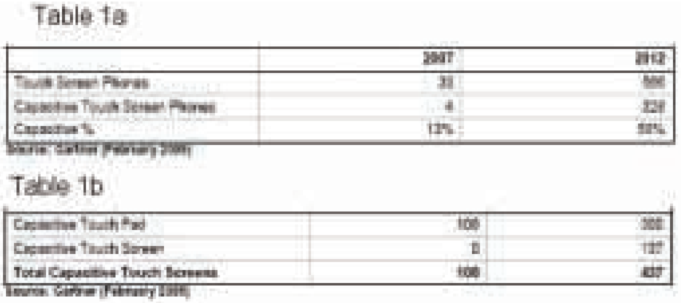

Table 1a

	2007	2012
Touch Screen Phones	33	566
Capacitive Touch Screen Phones	4	329
Capacitive %	12%	58%

Source: Gartner (February 2009)

Table 1b

Capacitive Touch Pad	108	300
Capacitive Touch Screen	0	137
Total Capacitive Touch Screens	108	437

Source: Gartner (February 2009)

Table: Projected Market Growth for Capacitive Touch Interfaces in the PC Market Segment

User interfaces also are a big growth area for 8-bit processors. According to a research study done by Gartner, the Apple iPhone has spurred the growth of capacitive-touch-sensor control in many consumer and PC applications (see Table 1a and 1b). To that end, according to Leong, microcontroller vendors are joining the march by adding MCUs that include capacitive-touch-sensor interfaces. Microchip, for instance, recently released the PIC16F72X family (mTouch series). The chips in this family include a capacitive-sensing module that implements an extension of the relaxation oscillator approach to sensing a change in capacitance. Additional 8-bit offerings with touch-sensing capabilities are available in the AVR family from Atmel and the programmable-system-on-a-chip (PSoC) devices from Cypress Semiconductor as well as other vendors.

Dave Bursky is a contributing editor for Chip Design and Embedded Intel Solutions magazines. He also is the technical editorial manager at Maxim Integrated Products Inc. in Sunnyvale, CA.

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- 8-KB code Flash
- 256-Byte RAM
- LCD driver (32 segments x 4 backplanes)
- System supervisory functions (POR, enhanced brownout detection)
- Two 16-bit timers
- System timer/RTC, Watchdog timer
- Two analog comparators
- Enhanced UART, I^{2}C-bus, SPI
- Internal RC oscillator trimmed to a ±1% accuracy with clock-doubler option
- Clock switching on the fly
- 23 configurable I/O pins
- Temperature range: -40 to + 85 °C
- Space-saving LQFP64 package

Application

- Consumer
- Industrial products
- Battery-powered devices
- Security systems
- White goods

These 8-bit microcontrollers use an accelerated architecture that executes instructions in two to four clocks, delivering performance that is six times higher than that of a standard 80C51 device.

The integrated LCD driver is applicable to a broad range of systems. Other integrated features such as byte-erasable Flash memory, enhanced timing functions, and power monitoring, make this MCU well suited to a very wide variety of applications, from battery-powered systems to white goods.

The LPC9402 has 8 KB of byte-erasable Flash code memory that can be used to simulate an EEPROM, with a full erase or program taking only 2 ms. It also has 256 bytes of Data RAM.

founded by Philips

The LCD driver provides 32 segments and supports up to four backplanes. It delivers low-power operation and minimizes display overhead by using an on-chip display RAM with auto-increment addressing. It requires no external components, and is compatible with TTL/CMOS components and chip-on-glass technology.

Serial interfaces include a 400-kHz I²C bus, an SPI bus, and an enhanced UART with fractional baud-rate generator, break detect, framing error detection, automatic address detection, and versatile interrupt capabilities.

On-chip features combine to reduce chip count, save board space, and lower overall cost. There are two analog comparators and two 16-bit counter/ timers, each configurable to toggle a port output on timer overflow or to act as a PWM output.

A 7.37-MHz internal RC oscillator with a ±1% tolerance over voltage and ambient temperature lets the microcontroller operate without external oscillator components. Users can adjust the IRC oscillator to other frequencies. When the clock-doubler option is enabled, the output frequency is 14.746 MHz. The on-chip Watchdog timer has a separate on-chip oscillator (nominal 400 kHz), calibrated to ±5% at room temperature, requires no external components, and is selectable from eight values. For optimal support of active mode with minimal power, on-the-fly clock switching is available with the internal RC oscillator, the Watchdog oscillator, and the external clock source. Fast switching maximizes performance.

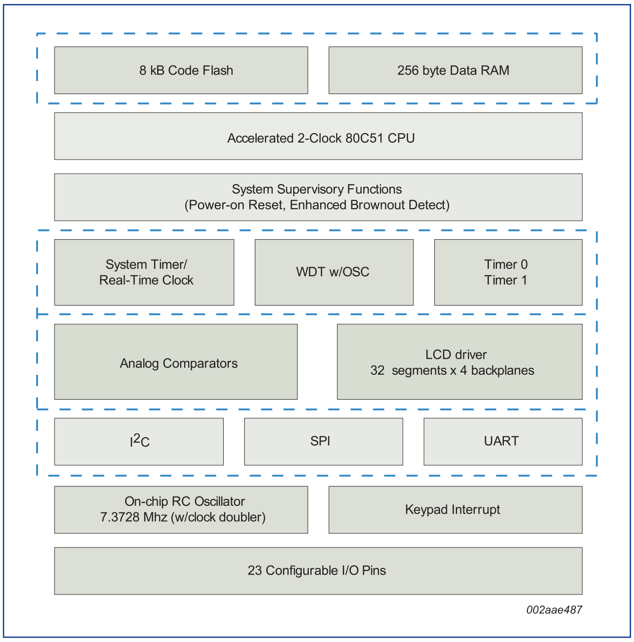
System supervisory functions include Power-on reset (POR) and enhanced brownout detection (BOD). Enhanced low voltage (brownout) detect allows a graceful system shutdown when power fails and can optionally be configured as an interrupt. The integrated real-time clock is equipped with independent power and clock supplies, permitting extremely low power consumption in power-save modes. To reduce power consumption further, each processor supports an idle mode and two different power-down modes. Total power-down current is less than 1 µA.

There are up to 23 I/O, each with a V_{DD} operating range of 2.4 to 3.6 V and a tolerance to 5 V. The operating temperature range is -40 to +85°C. The MCU is pin-to-pin compatible with P89LPC9401 devices in the same packages.

Third-Party Development Tools

Through third-party suppliers, NXP offers a range of development and evaluation tools for its microcontrollers. For the most current listing, please visit www.nxp.com/microcontrollers.

LPC9402 Block Diagram



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Document order number: 9397 750 16684
Printed in the Netherlands

NXP 80C51-based MCUs
LPC93x1

28-pin, 8-bit MCUs with enhanced RC oscillator and temp sensor

Building on the success of the LPC900 family, these high-performance MCUs use an accelerated 80C51 CPU to enhance performance. They offer high integration and are available in small, 28-pin packages.

Key Features

- Accelerated 80C51 CPU
- 4/8 KB code Flash
- 256-Byte RAM
- System supervisory functions (POR, enhanced brownout detection)
- Two 16-bit timers
- System timer/RTC, Watchdog timer
- Dual 8-bit ADCs/DACs (LPC9331/9341)
- On-chip temperature sensor (LPC9331/9341)
- Two analog comparators
- Enhanced UART, I^{2}C-bus, SPI
- Internal RC oscillator trimmed to a ±1% accuracy with clock-doubler option
- Clock switching on the fly
- 26 configurable I/O pins
- Temperature range: -40 to + 85 °C
- Small, 28-pin packages: TSSOP28

Application

- Consumer
- Industrial products
- Battery-powered devices
- Security systems
- HVAC
- Protocol conversion

These 8-bit microcontrollers use an accelerated architecture that executes instructions in two to four clocks, delivering performance that is six times higher than that of a standard 80C51 device.

Integrated features such as byte-erasable Flash memory, enhanced timing functions, and power monitoring, make these microcontrollers well suited to a very wide range of applications. On-chip features combine to reduce chip count, save board space, and lower overall cost.

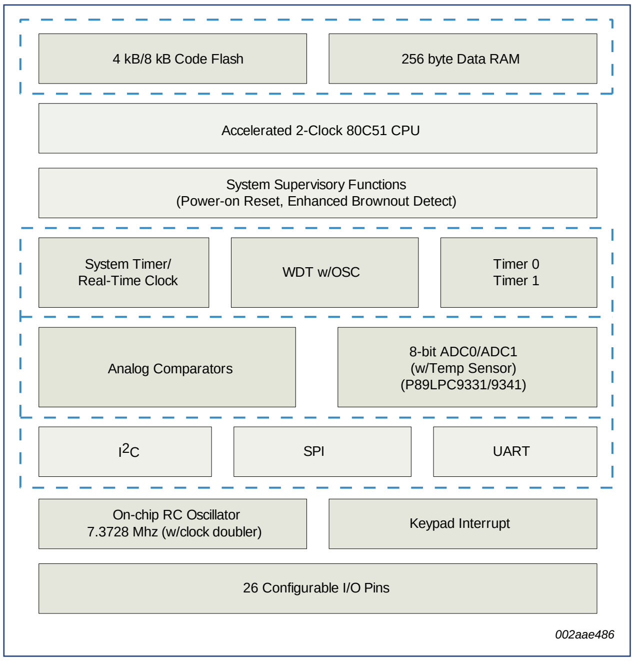
The LPC93x1 microcontroller has 4/8 KB of byte-erasable Flash code memory that can be used to simulate an EEPROM, with a full erase or program taking only 2 ms. It also has 256 bytes of Data RAM.

founded by Philips

Serial interfaces include a 400-kHz I²C bus, an SPI bus, and an enhanced UART with fractional baud-rate generator, break detect, framing error detection, automatic address detection, and versatile interrupt capabilities.

The LPC9331/9341 has dual 4-channel 8-bit A/Ds and 1-channel D/As. The on-chip temperature sensor is integrated within ADC0 and operates over a wide range (-40 to +85 °C). There are two 16-bit counter/ timers, each configurable to toggle a port output on timer overflow or to act as a PWM output.

LPC93x1 Block Diagram


4 kB/8 kB Code Flash
256 byte Data RAM
Accelerated 2-Clock 80C51 CPU
System Supervisory Functions
(Power-on Reset, Enhanced Brownout Detect)
System Timer/
Real-Time Clock
WDT w/OSC
Timer 0
Timer 1
Analog Comparators
8-bit ADC0/ADC1
(w/Temp Sensor)
(P89LPC9331/9341)
I2C
SPI
UART
On-chip RC Oscillator
7.3728 Mhz (w/clock doubler)
Keypad Interrupt
26 Configurable I/O Pins
002aae486

A 7.37-MHz internal RC oscillator with a ±1% tolerance over voltage and ambient temperature lets the microcontroller operate without external oscillator components. Users can adjust the IRC oscillator to other frequencies. When the clock doubler option is enabled, the output frequency is 14.746 MHz. The on-chip Watchdog timer has a separate on-chip oscillator (nominal 400 kHz), calibrated to ±5% at room temperature, requires no external components, and is selectable from eight values. To provide optimal support for active mode with minimal power, there is on-the-fly clock switching for the internal RC oscillator, the Watchdog oscillator, and the external clock source. Fast switching maximizes performance.

System supervisory functions include Power-on reset (POR) and enhanced brownout detection (BOD). Enhanced low voltage (brownout) detect allows a graceful system shutdown when power fails and can be optionally configured as an interrupt. To reduce power consumption further, each processor supports an idle mode and two different power-down modes. Total power-down current is less than 1 µA.

There are up to 26 I/O, each with a V_{DD} operating range of 2.4 to 3.6 V and a tolerance to 5 V. These MCUs are pin-to-pin compatible with P89LPC930/931/933/934 devices housed in the same packages.

Third-Party Development Tools

Through third-party suppliers, NXP offers a range of development and evaluation tools for its microcontrollers. For the most current listing, please visit www.nxp.com/microcontrollers.

Selector Guide

Type	Memory		I/O pins	ADC	DAC	Temp. Sensor	Serial interfaces		Temperature range (°C)	Package
	Flash	RAM					I²C-bus	UART		
P89LPC9301	4K	256 B	26				•	•	-40 to +85	TSSOP28
P89LPC931A1	8K	256 B	26				•	•	-40 to +85	TSSOP28
P89LPC9331	4K	256 B	26	2x4ch/8b	2x8b	•	•	•	-40 to 85 and -40 to 125	TSSOP28
P89LPC9341	8K	256 B	26	2x4ch/8b	2x8b	•	•	•	-40 to +85	TSSOP28

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Document order number: 9397 750 16683
Printed in the Netherlands

NXP 80C51-based MCUs LPC92x1

20-pin, 8-bit MCUs with enhanced RC oscillator and temp sensor

Building on the success of the LPC900 family, these high-performance MCUs use an accelerated 80C51 CPU to enhance performance. They offer high integration and are available in small, 20-pin packages.

Key Features

- Accelerated 80C51 CPU
- 2/4/8-KB code Flash
- 256-Byte RAM
- System supervisory functions (POR, enhanced brownout detection)
- Two 16-bit timers
- System timer/RTC, Watchdog timer
- 8-bit ADC/DAC (LPC9241/9251)
- On-chip temperature sensor (LPC9241/9251)
- Two analog comparators
- Enhanced UART, I^{2}C-bus
- Internal RC oscillator trimmed to a ±1% accuracy with clock doubler option
- Clock switching on the fly
- 18 configurable I/O pins
- Temperature range: -40 to + 85 °C
- Small, 20-pin packages: TSSOP20, DIP20

Application

- Consumer
- Industrial products
- Battery-powered devices
- Security systems
- HVAC
- Protocol conversion

These 8-bit microcontrollers use an accelerated architecture that executes instructions in two to four clocks, delivering performance that is six times higher than that of a standard 80C51 device.

Integrated features such as byte-erasable Flash memory, enhanced timing functions, and power monitoring make these microcontrollers well suited to a very wide range of applications. On-chip features combine to reduce chip count, save board space, and lower overall cost.

The LPC92x1 microcontroller has 2/4/8 KB of byte-erasable Flash code memory that can be used to simulate an EEPROM, with a full erase or program taking only 2 ms. It also has 256 bytes of Data RAM.

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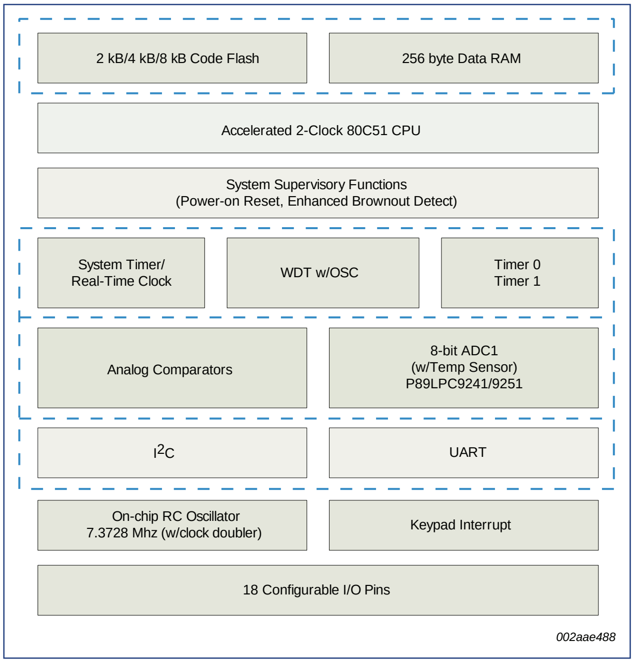
Serial interfaces include a 400-kHz I²C bus and an enhanced UART with fractional baud-rate generator, break detect, framing error detection, automatic address detection, and versatile interrupt capabilities.

The LPC9241/9251 has a 4-channel, 8-bit A/D and 1-channel D/A converters. The on-chip temperature sensor operates over a wide range (-40 to +85 °C), and there are two 16-bit counter/ timers, each configurable to toggle a port output on timer overflow or to act as a PWM output.

LPC92x1 Block Diagram


2 kB/4 kB/8 kB Code Flash
256 byte Data RAM
Accelerated 2-Clock 80C51 CPU
System Supervisory Functions (Power-on Reset, Enhanced Brownout Detect)
System Timer/ Real-Time Clock
WDT w/OSC
Timer 0 Timer 1
Analog Comparators
8-bit ADC1 (w/Temp Sensor) P89LPC9241/9251
I2C
UART
On-chip RC Oscillator 7.3728 Mhz (w/clock doubler)
Keypad Interrupt
18 Configurable I/O Pins
002aae488

A 7.37-MHz internal RC oscillator with a ±1% tolerance over voltage and ambient temperature lets the microcontroller operate without external oscillator components. Users can adjust the IRC oscillator to other frequencies. When the clock-doubler option is enabled, the output frequency is 14.746 MHz. The on-chip Watchdog timer has a separate on-chip oscillator (nominal 400 kHz), calibrated to ±5% at room temperature, requires no external components, and is selectable from eight values. To provide optimal support for active mode with minimal power, there is on-the-fly clock switching for the internal RC oscillator, the Watchdog oscillator, and the external clock source. Fast switching maximizes performance.

System supervisory functions include Power-on reset (POR) and enhanced brownout detection (BOD). Enhanced low-voltage (brownout) detect allows a graceful system shutdown when power fails and can be optionally configured as an interrupt. To reduce power consumption further, each processor supports an idle mode and two different power-down modes. Total power-down current is less than 1 µA.

There are up to 18 I/O, each with a V_{DD} operating range of 2.4 to 3.6 V and a tolerance to 5 V. These MCUs are pin-to-pin compatible with P89LPC920/921/922/924/925 devices housed in the same packages.

Third-Party Development Tools

Through third-party suppliers, NXP offers a range of development and evaluation tools for its microcontrollers. For the most current listing, please visit www.nxp.com/microcontrollers.

Selector Guide

Type	Memory		I/O pins	ADC	DAC	Temp. Sensor	Serial interfaces		Temperature range (°C)	Package
	Flash	RAM					I²C-bus	UART		
P89LPC9201	2K	256 B	18				•	•	-40 to +85	TSSOP20
P89LPC9211	4K	256 B	18				•	•	-40 to +85	TSSOP20
P89LPC922A1	8K	256 B	18				•	•	-40 to +85	TSSOP20 DIP20
P89LPC9241	4K	256 B	18	4ch/8b	1x8b	•	•	•	-40 to +85	TSSOP20
P89LPC9251	8K	256 B	18	4ch/8b	1x8b	•	•	•	-40 to +85	TSSOP20

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Robert Dotson,
President and Chief Executive Officer, T-Mobile USA

I'm Robert Dotson
I live a Mobile Life

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32-bit	Up to 512 Kbytes	64 - 100	Device, Embedded Host, Dual Role, OTG

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MICROCHIP

Partner Guide

Partners Gain with 8-bit and 16-bit Supply Chain Program

by John Blyler

Most everyone in the electronics industry supply chain has a partner program, but not all have the same breadth of engagements as Microchip's Design partner program. Here to tell us why is Cheri Keller, Microchip's Senior Worldwide Design Partner Program Manager.

[John Blyler] Before we discuss the partner program, let's lay the background. I can remember designing with Microchip PIC microcontrollers in colleague. But I didn't realize that Microchip had an extensive set of analog chips, as well as embedded software tools. Is the microcontroller business still big? **[Cheri Keller]** Based on worldwide shipments alone, Microchip is still No. 1 in the 8-bit market. True, we are seeing an upward trend to higher performance (16-, 24 and 32-bit) processors from our customers and design partners. But most are still using our 8-bit

[JB] What are the trends in the 8- and 16-bit markets? **[CK]** The emerging markets for us have been in the wireless area. Microchip has an extensive line of RF products, with recent emphasis in the ZigBee Alliance space. Interest has been strong across all segments of the wireless market, but especially so in medical and handheld devices. Our 8- and 16-bit chips are also strong in the industrial area, where robotic controllers are needed. And in consumer products, for toys that don't need a lot of horsepower but do need a lot of functionality.

[JB] Microcontroller, RF chip and even a fair amount of embedded software applications. That's quite a range of products. How do you service customers in this diverse space? **[CK]** Our ultimate goal is to be a matchmaker for our end customers, which is really the key to our partners program. In addition to significant technical support, we also offer our partners a network to our end customers. One way I've managed to improve this connection in the last year or so is with the addition of specialist categories within the partners program. Current we have three categories; medical, RF and M-Touch, which covers capacitive touch, inductor touch and touch screen capabilities. The latter specialty is a huge trend, thanks to consumer devices like the iPod. Microsoft has a proprietary technique using our microcontroller to interface with touch sensitive displays.

We created these specialist categories to address areas where our customers need the most design help. For example, medical and RF designs typically must go through a rigorous certification process. We know specialists in those areas that can help our customers navigate the qualification process. That's been a very large portion of the program in the last year or so.

[JB] Certification is crucial. But some customers want to enter these markets lacking a basic understanding of the technology requirements too. **[CK]** Exactly. Imagine that a customer has a great idea for a medical widget but they don't know how to develop that idea into hardware and software, to say nothing of the certification process. That is where we can help with specialist – from concept through full production and certification.

[JB] All of which leads us to the partners program, which must form the framework for all of the hardware, software and specialist services. Tell us about the program. **[CK]** We've had a network of partners program for more than a decade. As you would expect, our partners program is a means of extending Microchip's technical support capability to our customers—nearly 900 partners worldwide covering a range of technical expertise and markets. For example, let's say a customer needs help with an RF design. What parts of the design should be implemented in hardware versus software? How do I manufacture the end product? Our partners program contains a full supply chain of members that can help from product concept through manufacturing. We (Microchip) understand the customer's needs and link them up with our design partner network to get them to market as fast as possible.

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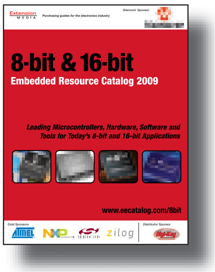

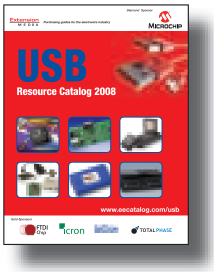

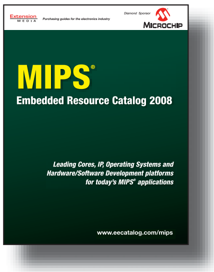

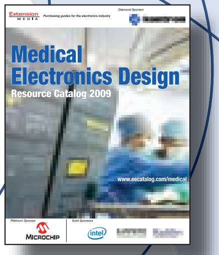

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EasyPIC®5 is a world-class tool that enables immediate prototype design. Thanks to many new features of this development tool, you can start creating your great devices immediately. **EasyPIC®5** supports 8-, 14-, 18-, 20-, 28- and 40- pin PIC® microcontrollers (it comes with the PIC®16F887). The **mikroICD** (In-circuit Debugger) enables very efficient debugging. Examples in **C**, **BASIC** and **Pascal** language are provided with the board. EasyPIC®5 comes with the following printed documentation: EasyPIC®5 Manual, PIC®Flash2 Manual and mikroICD Manual.

Evolving product features and modern input design require the use of touch screens. The **Touch screen controller** with connector available on EasyPIC®5 is a **display overlay** with the ability to display and receive information on the same display. It allows a display to be used as an input device. Touch screens are popular in the industry, where standard inputs such as switches do not work very well.

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- SPI Ethernet Library
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- Keypad Library
- LCD Library
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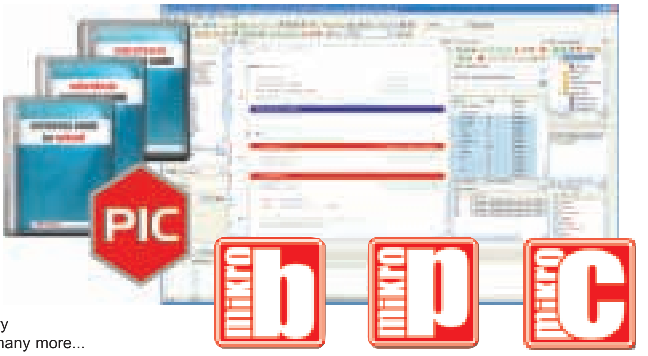
- OneWire Library
- PS/2 Library
- PWM Library
- RS-485 Library
- Software I²C Library
- Software SPI Library
- SPI LCD Library
- Sound Library
- SPI Library
- USART Library
- USB HID Library
- SPI LCD8 Library
- Port Expander Library
- Software UART Library
- SPI Graphic LCD Library
- SPI T6963C Graphic LCD Library
- Manchester Code Library and many more...



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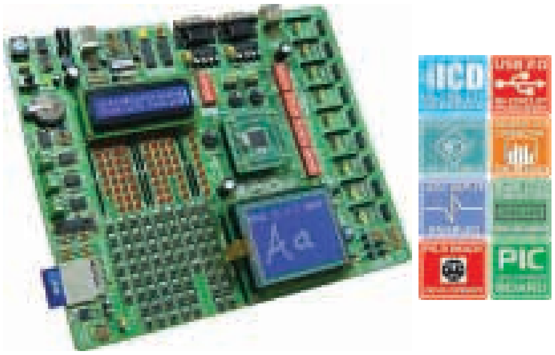
Complete Hardware and Software solution with on-board USB 2.0 programmer and mikroICD



System supports the latest (**64**) and **80-pin PIC**® microcontrollers (it is delivered with PIC®18F8520). Examples in **C**, **BASIC** and **Pascal** language are provided with the board. A **Touch screen** controller with connector is available on-board. This development board has an on-board ultra fast **USB 2.0** programmer, **mikroICD** (In-circuit Debugger) and integrated connectors for MMC/SD memory cards, 2 x RS232 port, RS485, CAN, on-board RTC, PS/2 connector, DAC etc...

PIC®PLC16B Development Board

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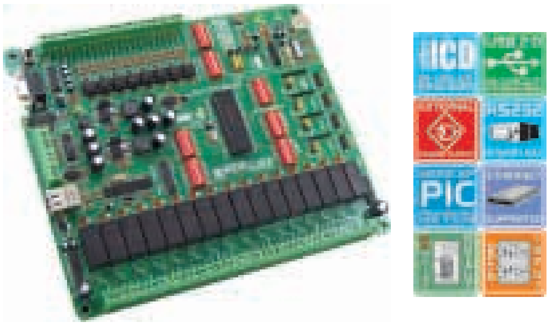

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mikroElektronika manufactures competitive development systems. We deliver our products across the globe and our satisfied customers are the best guarantee of our first-rate service. The company is an official consultant on the PIC® microcontrollers and the third party partner of Microchip® company. We are also an official consultant and third party partner of Cypress Semiconductors® since 2002 and official consultant of NXP® (former PHILIPS®) company as well. All our products are RoHS compilant.

Communication

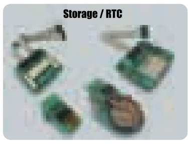
CAN-1 Board - Interfaces CAN via MCP2551.

CANSPI Board - Makes CAN network with SPI interface.

RS485 Board - Connects devices into RS485 network.

Serial Ethernet - Makes ethernet network with SPI Interface (ENC28J60).

IrDA2 Board - Irda2 serves as wireless RS232 communication between two MCUs.



CF Board - Provides easy way to use Compact flash in your design.

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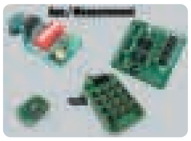
EEPROM Board - Is serial EEPROM board via I2C interface.

RTC Board - Is PCF8583 RTC with battery backup.



ADC Board - Is 12-bit analog-to-digital converter (ADC) with 4 inputs.

DAC Board - Is 12-bit digital-to-analog converter (DAC) with SPI.

Keypad 4x4 Board - Adds keypad to your application.

Accel. Board - Accel. is an electronic device that measures acceleration forces.

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16PIC
CAN bootloader

The **16-bit PIC CAN bootloader** for 16-bit Microchip™ devices consists of firmware and software for PC.

The firmware is located in the non-volatile memory of the MCU/DSC and allows the device to be reprogrammed by using a CAN bus and a master device that guides the process.

The PC software acts as the master in the process and allows for selecting the CAN device to be used, the communication baud rate, the bootloader ID messages, the CAN node to bootload, etc.

It also includes a checksum operation at the end of programming process.

More information at *www.ingenia-cat.com*.

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16PIC
serial bootloader

The **16-bit PIC serial bootloader** is a firmware located in the non-volatile memory of a microcontroller unit (MCU/DSC) that allows in-circuit reprogramming of the device using its standard serial communication ports.

The 16-bit PIC serial bootloader works for all 16-bit MCU/DSC Microchip™ devices (PIC24F, PIC24H, dsPIC30F and dsPIC33F), and includes automatic baud rate detection, checksum operation and many more additional features that enable a fast and user-friendly interaction.

The package includes the firmware programming for the desired 16-bit MCU or DSC and a proprietary graphical user interface (GUI) based on Windows OS.

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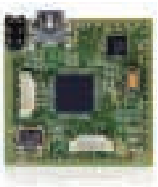

iCM4011 is a dsPIC based development board that allows to develop applications requiring calculation capacities of up to 30MIPS. Its architecture is based on dsPIC30F4011 and incorporates transceivers for the most common communication protocols (RS485, RS232,USB and CAN).

The board can be USB powered, giving the module full plug&play functionality.

The processor comes preprogrammed in the factory with bootloader firmware that allows the user to load programs through a RS232 or USB port in a few seconds, without the need for an external programmer. It also incorporates an ICSP connector for debugging applications.

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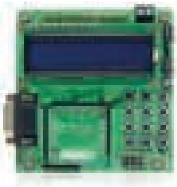

UIB-PC104 is a User Interface Board that enables interaction between a human and a control module connected to its main socket through inputs and outputs commonly known as human interfaces.

The design of a good user interface affects the amount of effort the user must use to provide the system with inputs and to interpret the output from the system, as well as the time needed to learn how to do this. The UIB-PC104 has been designed while paying special attention to its usability, to provide users with an efficient, simple and effective training tool.

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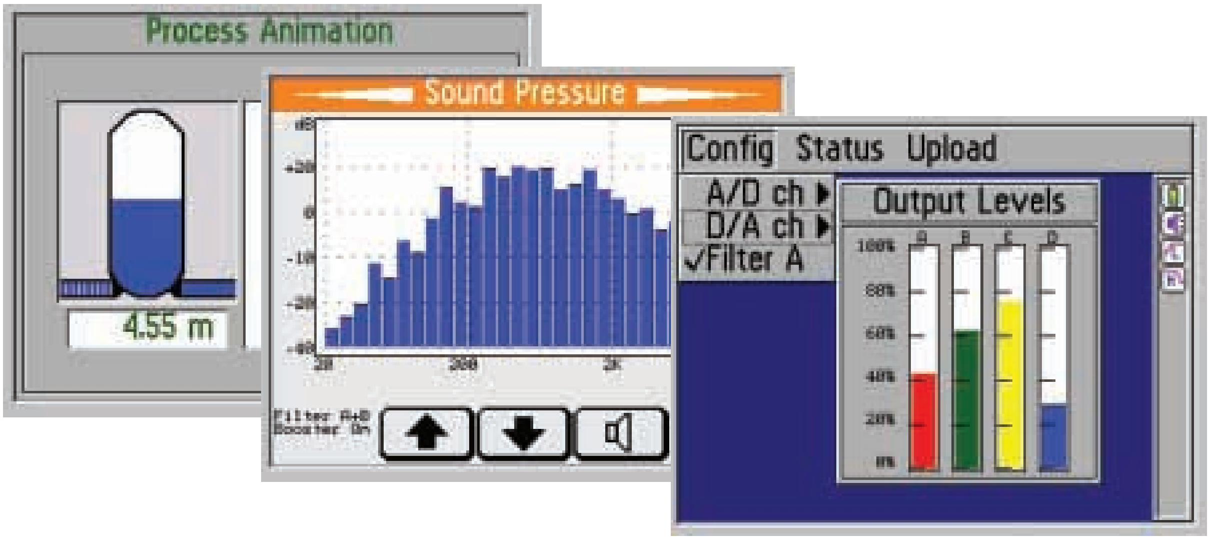
Display Controller GUI Libraries

C source Libraries for Embedded Processor Applications


Process Animation
4.55 m
Sound Pressure
dB
+20
0
-10
-20
-40
20
200
2K
Filter A+B
Booster On
Config
Status
Upload
A/D ch
D/A ch
✓Filter A
Output Levels
A
B
C
D
100%
80%
60%
40%
20%
0%

RAMTEX International is a leading provider of Graphic User Interface software libraries for small and medium-sized embedded processor systems.

The advanced GUI libraries provide a versatile and powerful function set which facilitates the creation of any GUI style to suit the given embedded application. The libraries are optimized for a small memory foot print and can be used with any processor type supported by standard C conforming compilers.

The product tool chain includes tools for :

- The creation of graphic icons and multi-language fonts.
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- Display controller simulation and fast prototyping using PC compilers.
- GUI testing on the PC using real display module hardware for screen output.

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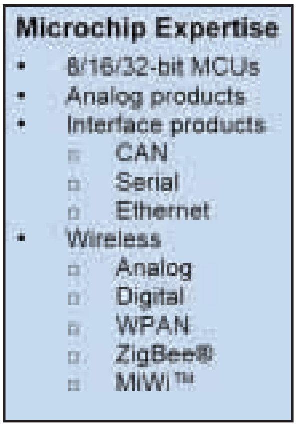

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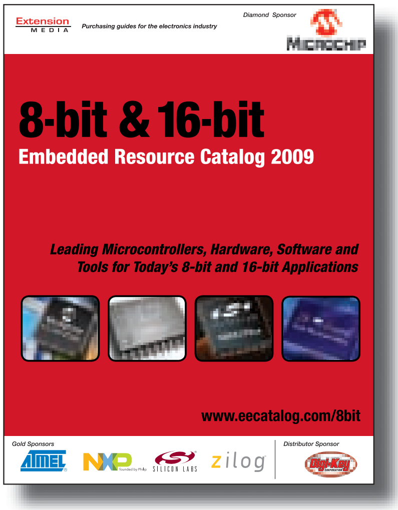

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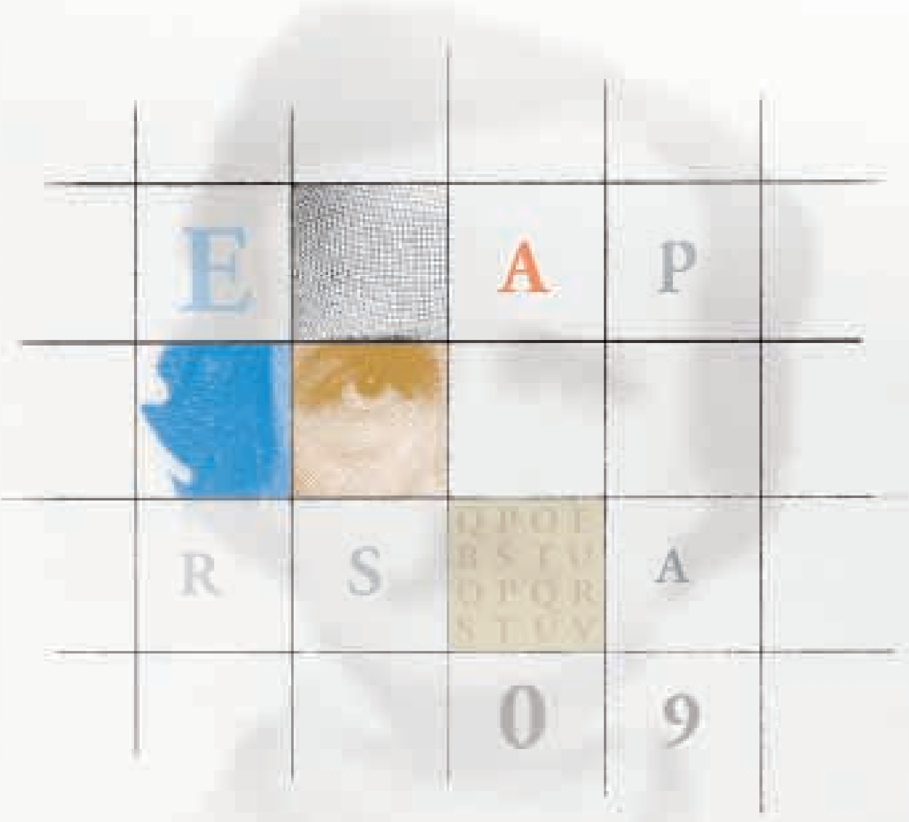

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[†] Computer Security International (CSI) Computer Crime and Security Survey, 2008.

ASIX Electronics Corporation

AX220xx Family Embedded WLAN SoC

Supported 8-bit Architectures: 8051/80390

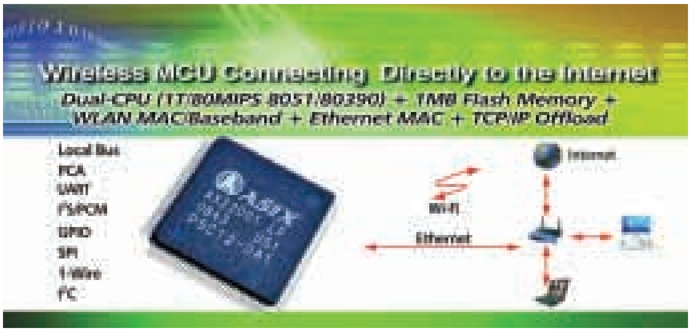
AX220xx, Single Chip Microcontroller with TCP/IP and 802.11 WLAN MAC/Baseband, is a System-on-Chip (SoC) solution which offers high performance dual-CPU architecture with on-chip 1MB shared Flash as Program Memory, on-chip 64KB Data Memory for Main CPU (MCPU), on-chip 32KB Data Memory for Wi-Fi CPU (WCPU), TCP/IP accelerator, 802.11a/b/g compatible WLAN MAC/Baseband, Fast Ethernet MAC and rich communication peripherals for wide varieties of application which need access to the wired/wireless LAN or Internet.

The dual-CPU architecture of AX220xx utilizes the MCPU for applications and TCP/IP processing and the WCPU for WLAN protocol processing and Ethernet to WLAN packet format translation. The built-in WLAN MAC and Baseband processor are compatible with IEEE 802.11a/b/g standard and support security features compatible with 802.11i and QoS features compatible with IEEE 802.11e and support operation in Infrastructure or Ad-Hoc (IBSS) network topology.

In addition to stand-alone application, AX220xx with TCP/IP protocol suite on-chip and local bus host interface, high speed UART or SPI interface, can be used as network co-processor to offload TCP/IP and WLAN protocol processing loading from system CPU in an embedded system.

FEATURES & BENEFITS

- High integration with MCU, Flash, TCP/IP, WLAN MAC/BB and Ethernet MAC in a single chip enabling compact, simple, low power and low cost Internet connection capability for many applications
- High-density on-chip 1MB flash memory facilitating graphical web server design for embedded applications requiring remote access, allowing users access from web browser anywhere
- High performance Dual-CPU (1T/80MIPS 8051/80390) architecture, DMA engine and TCP/IP accelerator permitting efficient and high performance embedded system design
- Easy to use - 100% software compatible with standard 8051/80390. Updating firmware over the network


Wireless MCU Connecting Directly to the Internet
Dual-CPU (1T/80MIPS 8051/80390) + 1MB Flash Memory + WLAN MAC/Baseband + Ethernet MAC + TCP/IP Offload
Local Bus
PCA
UART
I²S/PCM
GPIO
SPI
1-Wire
I²C
ASIX
Wi-Fi
Ethernet
Internet

TECHNICAL SPECS

- Dual-CPU architecture for Application and WLAN Protocol Processing: 8-bit pipelined RISC, single cycle per instruction operating up to 80MHz
- Embeds on-chip 1MB Flash memory, 64KB data memory for MCPU and 32KB data memory for WCPU
- Built-in TCP/IP accelerator, 802.11a/b/g compatible WLAN MAC/Baseband and Fast Ethernet MAC
- Variety of System Interfaces: SPI, I^{2}C, UART, I^{2}S/PCM, 1-Wire, Local Bus and GPIO
- 128-pin (AX22001) or 164-pin (AX22011) E-Pad LQFP RoHS compliant package; Updating firmware through Wi-Fi, Ethernet or UART

AVAILABILITY

Limited sampling is available now, and volume production is expected in Q3 2009. To find a distributor near you, please visit our website at *http://www.asix.com.tw/distributor.php*.

APPLICATION AREAS

AX220xx provides very cost effective networking solution to enable simple, easy and low cost Internet connection capability for many applications such as consumer electronics, networked home appliances, industrial equipments, security systems, remote data collection equipments, remote control, remote monitoring and remote management.

CONTACT INFORMATION

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R.O.C.
+886-3-5799500 Telephone
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Microchip Technology Inc.

8-bit Microcontrollers Designed for Low-Cost, Low-Power and High-Performance Operation

Supported 8-bit Architectures: PIC® Microcontrollers

The PIC18F4XK20/2XK20 family of 8-bit microcontrollers sets a new benchmark for lower power consumption, low cost and high-performance operation.

To control power consumption, the new 28-, 40- and 44-pin microcontrollers provide nanoWatt Technology features that include power-managed modes, an operating voltage range of 1.8V to 3.6V and efficient on-chip peripherals. Additionally, speeds of 16 MIPS (64 MHz) can be achieved at 3V operation from the internal oscillator, offering high performance while maintaining low power consumption. All of these features make this microcontroller family ideally suited for general-purpose control, and a broad range of battery-operated or low-power applications.

With the ever-increasing focus on portable applications that require reduced energy consumption and increased functionality, there is a clear need for embedded electronic intelligence that can do more with less. Microchip's PIC18F4XK20/2XK20 devices meet these needs head-on, not just with the levels of performance, but also at a cost-effective price point. Additionally, this family continues Microchip's easy migration strategy, providing full code, pin-out and tool compatibility with the Company's comprehensive portfolio of 8-bit microcontrollers.

Enhanced on-chip peripherals available include a software-selectable, precision 16 MHz internal oscillator with Phase Lock Loop (PLL); a Master Synchronous Serial Port (I^2C™/SPI) module with address masking; a four-channel, and dual rail-to-rail comparators.

High Performance
MICROCHIP
PIC18F45K20
MICROCHIP
PIC18F25K20
Low Power

FEATURES & BENEFITS

- Up to 64 Kbytes of Flash program memory
- Up to 3,936 bytes of RAM
- Up to 1,024 bytes of Data EEPROM memory
- Programmable Brown-Out Reset, with a software-enable option
- Extended WatchDog Timer

TECHNICAL SPECS

- Enhanced low-power Timer 1
- EUSART with LIN compatibility
- Two-speed oscillator start-up
- 10-bit Enhanced Capture/Compare Pulse-Width Modulation module with PWM steering capability
- Up to 14 10-bit Analog-to-Digital Conversion channels with a 1.2V fixed voltage reference

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Microchip Technology Inc.

8-bit PIC® Microcontrollers for Segmented Display Applications

Supported 8-bit Architectures: PIC® Microcontrollers

The PIC18F87J90 family of 8-bit direct LCD-drive microcontrollers (MCUs) with nanoWatt Technology feature 64 - 128 KB Flash and 4 KB RAM, and are the industry's first 8-bit MCUs to include a Real-Time Clock and Calendar (RTCC) and Charge Time Measurement Unit (CTMU) peripheral for capacitive touch sensing or precise time measurement. The PIC18F87J90 devices are pin compatible with Microchip's PIC18F85J90 devices, providing an easy migration path across Microchip's entire LCD-drive MCU family and simplified application upgrades.

Many designers want to enhance and add features to their display applications, such as capacitive or inductive touch user interfaces. The PIC18F87J90 products meet this need head-on, with their extended memory range and integrated peripheral set including the CTMU. With Microchip's unique nanoWatt Technology, the MCUs help maintain the system's low-power ratings, and can even drive the display in sleep mode to conserve power. Additionally, the onboard LCD module contains a software-programmable contrast controller, which provides display boost or dimming and compensates for environmental elements such as temperature and lighting. The on-chip hardware RTCC works even in sleep mode to enable real-time tracking and lower power consumption.

To get started, purchase the PICDEM™ LCD 2 Demo Board in combination with the PIC18F87J90 Plug-In Module, which includes capacitive-touch buttons.

FEATURES & BENEFITS

- These 64- and 80-pin devices extend the memory reach and peripheral set of Microchip's LCD MCU portfolio.
- Microchip's LCD Design Center offers complete information on application notes, reference designs, development tools, free code libraries and recommended devices: www.microchip.com/lcd.

MICROCHIP LCD
PIC18F87J90
MICROCHIP
PIC18F87J90
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4
5
6
7
8
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AVAILABILITY

Now. For further information, contact any Microchip sales representative or authorized worldwide distributor, or visit Microchip's Web site at *www.microchip.com/lcd*.

APPLICATION AREAS

The PIC18F87J90 MCUs are designed for cost-sensitive embedded display applications in the consumer (white goods, game controllers, exercise equipment, thermostat and counter top appliances); industrial (home-alarm/security-system keypads, power meters, data logging and central AC communication controllers); medical (flow meters, patient monitors, laboratory instruments and home-diagnostic devices); and automotive markets (dashboard and control panels).

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PIC16F72X 8-bit Flash Microcontrollers for Numerous Cost-Sensitive Applications

Supported 8-bit Architectures: PIC® Microcontrollers

Embedded designers can integrate even higher levels of functionality into a wide variety of cost-sensitive applications with the PIC16F722/3/4/6/7 (PIC16F72X) 8-bit Flash MCUs from Microchip.

The 28- and 40-pin PIC16F72X devices are capable of operation down to 1.8V and feature a 16 MHz internal oscillator; up to 14 ADC channels; communication (SPI, I^2C™, AUSART) and two Capture, Compare and PWM (CCP) modules; plus the mTouch™ Sensing Solution peripheral.

The PIC16F72X MCUs have an operating voltage range of 1.8 – 5.5V, with the low-power PIC16LF72X devices offering lower standby and other power-consumption specifications from 1.8 – 3.6V. Both variations feature a Timer1 Gate that runs from the internal 16 MHz oscillator, providing ease in conditional event counting and measurements. With up to 14 ADC channels, two CCP modules and communication peripherals, the MCUs increase design flexibility with the ability to interface with external devices such as environmental sensors, as well as provide additional system control and monitoring.

The mTouch Sensing Solution peripheral makes it easy to add proximity sensing or capacitive touch-sensing user interfaces in place of mechanical buttons or switches, if designers so choose. Additionally, the mTouch peripheral can operate while the device is in "sleep mode," bringing further power savings to the user.

FEATURES & BENEFITS

- The new MCUs have integrated in-circuit debug and are supported by the MPLAB® IDE Integrated Development Environment, available as a free download from Microchip's Web site (www.microchip.com/MPLAB).
- MPLAB REAL ICE™ in-circuit emulator support
- The PIC16F722/3/6 and PIC16LF722/3/6 MCUs are available in 28-pin SPDIP, SOIC, SSOP and QFN packages; with prices starting at $0.91 each in 10,000-unit quantities.
- The PIC16F724/7 and PIC16LF724/7 MCUs are available in 40-pin PDIP, TQFP and QFN packages; with prices starting at $1.34 each in 10,000-unit quantities.

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PIC16F722
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PIC16LF727

AVAILABILITY

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APPLICATION AREAS

Example general-purpose applications for the PIC16F72X and PIC16LF72X MCUs include: appliance (blenders, refrigerators, dishwashers); consumer/home electronic (toys, cell phones, phone chargers, electric shavers, vacuum cleaners); industrial (digital water heaters, security systems, HVAC control); automotive (car audio, remote controls, power seats, lighting control).

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PIC16F88X Family of General-Purpose, Small PIC® Microcontrollers

Supported 8-bit Architectures: PIC® Microcontrollers

The PIC16C88X 8-bit microcontroller family from Microchip Technology consists of 28- and 40/44-pin PIC® devices for use in a wide range of applications. The PIC16F88X family maintains compatibility with the PIC16F87XA family for easy migration, while providing a host of new features designed to save users time and money—both during and after their design cycle. The enhancements include dual internal oscillators with clock switching and fail-safe clock mode; more (up to 14) ADC channels; an advanced comparator module featuring two comparators and a Set/Reset Latch to allow emulation of many analog circuits; and low-power enhancements that extend battery life.

Embedded system designers' marketplaces are constantly changing. Quite often, functions and features are added to a customer's product in the middle of the design cycle, as new requirements emerge. Therefore, system designs must be fluid and easily adaptable in order to evolve with the changing landscape. These dynamics require a high degree of flexibility from the chosen microcontroller architecture. Microchip's PIC16F88X family is complemented by a vast portfolio of pin- and code-compatible PIC microcontrollers that enable customers to quickly move to the right part for their chosen application, without having to write all new code.

FEATURES & BENEFITS

- Up to 14 Kbytes of Self-write Program Flash and low-voltage programming to enable field programmability
- Up to 256 bytes of Data EEPROM for variable data storage
- Onboard In-Circuit Debug module for simpler system troubleshooting
- Advanced Analog Peripherals: Enhanced analog comparator module, featuring 2 comparators with Set/Reset Latch mode; up to 14 10-bit ADC channels; 0.6V reference voltage for comparators and ADC

TECHNICAL SPECS

- Low Power Features: low-power wake up; enhanced low-current watchdog timer; low-power Timer 1 oscillator
- Extended Watchdog Timer with low current draw: serial communication interfaces; UART/SCI connectivity via EUSART module; Master Mode SPI and I²C™ with Address Mask option

MICROCHIP
PIC16F883
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PIC16F887
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PIC16F886
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- Master Synchronous Serial Port (MSSP) with slave address mask
- More General Purpose I/O, with up to 36 pins that can be used for I/O, and Interrupt-on-change capability for each I/O pin
- Enhanced USART (EUSART)

AVAILABILITY

Now. For further information, contact any Microchip sales representative or authorized worldwide distributor, or visit Microchip's Web site at *http://www.microchip.com/8bit*.

APPLICATION AREAS

The family targets a wide range of general-purpose, horizontal applications. Specific application examples include battery-operated systems and battery management, space-constrained and small form factor applications, analog-intensive applications (due to the rich on-chip analog peripheral set), and mechatronics.

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World's First 16-bit Microcontrollers With 64 Kbytes of Flash in 28-pin Packages

Supported 16-bit Architectures: PIC® Microcontrollers

With the PIC24FJ64GA004 16-bit microcontroller family, Microchip Technology extends its 16-bit portfolio by providing smaller and lower cost 28- and 44-pin packages with 16 to 64 Kbytes of Flash program memory and up to 8 Kbytes of RAM. The PIC24FJ64GA002 microcontroller provides more onboard memory than any other 28-pin packaged 16-bit microcontroller. The entire PIC24FJ64GA004 family allows the flexible use of all onboard peripherals, by enabling designers to map them to the pin they desire through the "Peripheral Pin Select" pin-mapping function.

Design engineers are adding functions in software to even the smallest microcontrollers, driving the demand for higher performance and larger memory in low pin count packages—to better address cost- and space-constrained applications. The PIC24FJ64GA004 family's industry-leading memory densities, in packages as small as a 6x6 mm QFN, address these design concerns.

However, engineers still require a broad range of peripheral combinations within these low pin count packages. The PIC24FJ64GA004 family contains a similar peripheral set to the 100-pin PIC24FJ128GA family, in a package as small as 28 pins. Through Peripheral Pin Select, Microchip enables designers to use the available pins in the exact manner they like. This flexibility provides engineers with the option to use a smaller, more cost-effective microcontroller.

The PIC24FJ64GA004 family is designed to meet a wide range of design engineering needs across a broad spectrum of industries.

FEATURES & BENEFITS

- Two independent channels of I²C™, UART and SPI communications, enabling communications to a number of devices over multiple protocols, for easier system design.
- Designed for an easy transition to other members in the PIC24F family and for migration to other families in Microchip's 16-bit portfolio, including the PIC24H and dsPIC33 families, through code compatibility.

up to 64 KB
MICROCHIP
PIC24FJ64GA002
in
28 Pins

AVAILABILITY

Now. For further information, contact any Microchip sales representative or authorized worldwide distributor, or visit Microchip's Web site at *http://www.microchip.com*.

APPLICATION AREAS

The PIC24FJ64GA004 family is designed to meet a wide range of design engineering needs across a broad spectrum of industries. Specific application examples include: consumer (security systems, heating control, audio equipment); automotive (body control, steering systems); instrumentation/measurement (scales, medical instruments and monitoring); industrial (building monitor-and-control systems, security/access systems, sensors).

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www.microchip.com

Silicon Laboratories

High Pin Count, Touch-sensing, 8-bit MCUs

Supported Operating Systems: 8051

Supported 8-bit Architectures: 8-bit, 8051

The C8051F7xx family of high pin-count MCUs for cost-sensitive, high I/O embedded systems offers a robust, accurate, responsive and easy to configure touch sensing feature. With up to 54 general purpose I/O pins and a 25 MIPS 8051 CPU, the C8051F7xx family brings a high level of processing power and flexibility.

FEATURES & BENEFITS

- Fastest touch sense on-chip peripheral uses a capacitance-to-digital converter with 40 us acquisition time combined with 25 MIPS CPU enabling sophisticated cap sense, even when large arrays of touch sense elements are used.
- With up to 32 touch sensing inputs, featuring wake-on-touch, the MCU can be placed in a power saving mode and wake quickly upon touch to save overall system power in applications.
- A highly accurate 10-bit SAR ADC with on-chip voltage reference and temperature sensor provides best-in-class analog capability for measurement and control.
- Up to 54 general purpose I/Os are offered to be used as ADC voltage measurement inputs, capacitive touch-sense inputs and/or digital communications I/Os.
- A calibrated two percent oscillator with guaranteed accuracy over the full MCU voltage supply and temperature range eliminates the need for an external crystal.

Silicon Labs offers a full suite of industry-leading tools to help speed design and accelerate market entry with the C8051F7xx. A complete, low-cost professional development kit includes everything required to immediately begin system design including IDE, target board, cables and power supply. A Silicon Labs GUI is provided for easy and intuitive setup of the capacitive touch sense peripheral to get the desired configuration and performance in minutes. To enter to win a free development kit for the C8051F7xx, visit *www.silabs.com/C8051F7xxgiveaway*.

SILICON LABS
C8051F7xx
High Performance
Capacitive Touch Sensing

TECHNICAL SPECS

- In-system, full-speed, non-intrusive debug interface (on-chip)
- the C8051F7xx family offers byte-erasable EEPROM with 100,000 write/erase cycle endurance guaranteed for storage of frequently updated data
- Implemented SMBus/I2C, UART, and SPI serial interfaces
- 16 kB of on-chip Flash memory
  512 bytes of on-chip RAM
- On-chip Watchdog timer
  On-chip Power-On Reset and Supply Monitor

AVAILABILITY

Available now in QFP64, QFP48, and QFN48 packages.

APPLICATION AREAS

Industrial Controls, Security Systems, Residential HVAC, Home Appliances, Keyboards, Cash Machines and Fax/Printer/Scanner Front Panels

CONTACT INFORMATION

SILICON LABS

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mcuinfo@silabs.com
www.silabs.com/mcu

Silicon Laboratories

Low Power Mixed-signal 8-bit MCUs

Supported Operating Systems: 8051

Supported 8-bit Architectures: 8-bit, 8051

The C8051F9xx MCU family is capable of full-spec operation down to 0.9 V and up to 3.6 V, enabling single-cell battery operation as well as dramatically increased battery life for dual-cell applications. With an integrated dc-dc converter, the C8051F9xx has been designed to provide a fast wake-up time, low active-mode, and ultra-low sleep mode current consumptions.

Best-in-Class Tools
Silicon Labs delivers industry-leading tools to help speed design and accelerate market entry. The complete, low-cost professional development kits include everything required to immediately begin system design including IDE, target board, cables, and power supply. An inexpensive ToolStick Daughter Card and Base Adapter also provide a full development environment. *www.silabs.com/toolstick*

FEATURES & BENEFITS

- One-cell mode 0.9–1.8 V, two-cell mode 1.8–3.6 V. Built-in dc-dc converter with 1.8 –3.3 V output can supply external devices. Retains state and RAM contents over full supply range; fast wakeup.
- 10-Bit ADC with up to 300 ksps, up to 15 external inputs, external pin or internal VREF (no external capacitor required), built-in temp sensor. Two Comparators, low current. Up to 15 Capacitive Touch Sense inputs
- High-Speed 8051 25MHz Single Cycle Core
  - Pipe-lined instruction architecture; executes 70% of instructions in 1 or 2 system clocks
  - 25 MIPS peak throughput with 25 MHz clock
  - Expanded interrupt handler
- Digital Peripherals
  - 16 port I/O; All 5 V tolerant with programmable drive strength
  - Hardware enhanced UART, SPI and SMBus™ serial ports available concurrently
  - Low power 32-bit smaRTClock (0.5 uA) operates down to 0.9V
- 4352 bytes internal data RAM (256 + 4K)
  - 64 kB bytes Flash; In-system programmable in 1024-byte sectors; Full read/write/erase functionality over the entiresupply range

Industry's Lowest Voltage MCU
.9
SILICON LABS
C8051F9xx

TECHNICAL SPECS

- Precision internal oscillators: 24.5 MHz with ±2% accuracy supports UART operation; spread-spectrum mode for reduced EMI
- Ultra-Small Package
  - 24-pin QFN (4x4 mm)
- Temperature Range: –40 to +85 °C
- On-chip debug circuitry facilitates full speed, non-intrusive in-system debug (no emulator required)

AVAILABILITY

Available Now in QFN35, QFN24, LQFP32 packages

APPLICATION AREAS

Portable Personal Medical Products, Remote Controls, Portable Audio, Consumer Electronics, Wireless Sensors and Security, Wireless Meter Reading, Industrial Monitoring and Control

CONTACT INFORMATION

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Silicon Laboratories

USB 8-bit MCUs

Supported Operating Systems: 8051

Supported 8-bit Architectures: 8-bit, 8051

The C8051F3xx USB MCU family includes a USB 2.0 function controller with an integrated transceiver and on-chip clock recovery. No external resistors, crystal, voltage regulator, EEPROM or other components are required. On-chip resources include a high-speed 8051 CPU with up to 64 kB Flash, UARTs, I2C, SPI, timers, counters and PWM generators. On-chip analog features include a multi-channel 10-bit ADC, precision voltage reference, internal oscillator, comparators and a temperature sensor.

FEATURES & BENEFITS

- A single-chip solution for embedded USB applications
- 10-bit ADCs with programmable throughput up to 200 ksps, ±1 LSB INL with no missing codes
- ADCs also feature up to 17 external inputs that can be programmed to operate in single-ended or differential mode
- Other analog peripherals include two comparators, built-in temperature sensor and internal precision voltage reference
- High level of integration results in small package sizes, saving board space and reducing overall system cost

Silicon Laboratories' development kits include advanced debug features enabling the user to fully develop and integrate hardware and software design. Since the MCU has built in debug capabilities, it can be installed into the end application. This development system is not encumbered with sockets, target cables or "ICE Chips." The development kit supports the following debug features: Run, halt and single-step, set hardware breakpoints, inspect/modify memory and registers, download program memory.

Embedded USB Made Easy
Full Range of Single-Chip MCUs
Device and Host Drivers
Extensive HW and
SW Reference Designs
USB

TECHNICAL SPECS

- USBXpress Development Software provides a complete host and device software solution, including Microsoft Windows device drivers
- No USB protocol or hardware expertise is required. A simple, high-level API is used on both the host and USB MCU to achieve high-performance USB connectivity
- USBXpress Development Software includes royalty-free, Microsoft-certified device drivers, INF driver installation files, host API library and MCU API library
- Microsoft Windows 2000, XP, Vista and WinCE (4.2, 5.0 and 6.0)* are supported

AVAILABILITY

Available now in 28-pin QFN, 32-pin LQFP or 48-pin TQFP packages.

APPLICATION AREAS

PC Peripherals, Point-of-Sale Terminals, Consumer Medical Devices, PC-based Lab Instrumentation, USB Modems, Game Controllers, IP Telephones, Upgrade Legacy RS-232 to USB, Personal Navigation Devices

CONTACT INFORMATION

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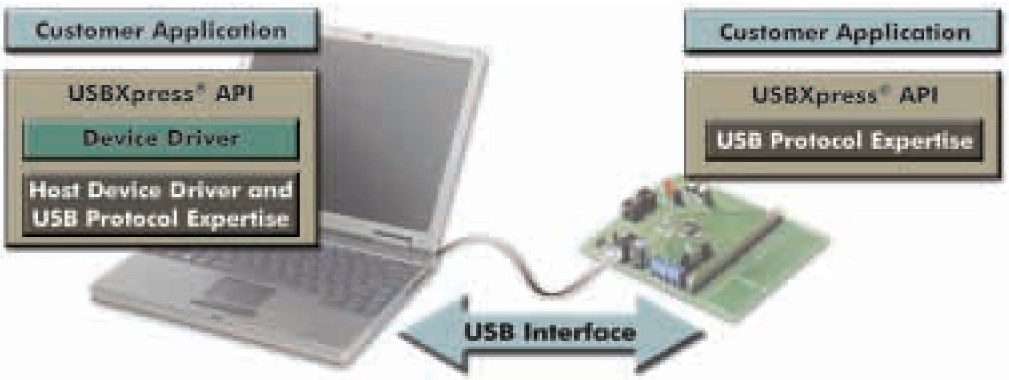
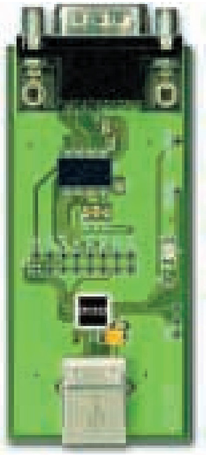
We Provide Everything to Make USB Designs Easy
Reference Designs
UART Bridges
MCUs
Drivers
FLASH MEMORY
HIGH SPEED 8051
ADC
USB 2.0

Low-Cost Embedded USB

Silicon Laboratories' extensive portfolio of USB MCUs and USB to UART Bridges include complete, low-cost development tools and drivers to make system design quick and easy. Software examples for real life systems are also available and include a mass storage device, USB audio and human interface device. The USB MCUs feature an on-board USB 2.0 function controller with an integrated transceiver that requires no external oscillator. On-chip resources include a high-speed 8051 CPU (up to 48 MIPS) with up to 64 kB Flash, multi-channel 10-bit ADC, voltage reference, internal oscillator, UARTs, SMBus, SPI, timers, counters and PWM generators.


Customer Application
USBXpress® API
Device Driver
Host Device Driver and USB Protocol Expertise
Customer Application
USBXpress® API
USB Protocol Expertise
USB Interface



USB to UART Bridge

- Single Chip (5x5 mm)
- USB 2.0 Controller
- UART Interface
- Update RS-232 Designs

Product details: www.silabs.com/USB

MCUs | TIMING | POWER | BROADCAST | WIRELINE | WIRELESS

SILICON LABS®
www.silabs.com

Zilog, Inc.

Classic Z8® Microcontrollers

Supported Operating Systems: Any

Supported 8-bit Architectures: Z8®/Z8 GP™

Targeted for high-volume applications, Zilog's flagship discrete Classic microcontroller family combines advanced 8-bit MCU capabilities, programming ease and a competitive pricing structure. The classic family is comprised of the following subfamilies – Z8 ROM/OTP, Z8 Low Voltage, Z8 ROMless and Z8 GP Microcontrollers. Each subfamily features Zilog's easy-to-use register-to-register-based architecture and comes in a wide range of memory sizes, voltage options and extended temperature ranges to fit any embedded design requirement.

The Z8 ROM and OTP devices feature up to 32 GPIO, up to 64 KB of ROM, up to 6 vectored interrupts, two 8-bit timers, analog comparators and various communication interfaces (UARTs, etc.). The Z8 one-time-programmable (OTP) devices substitutes OTP memory for ROM program memory, simplifying development for cost-conscious applications. They can also be seamlessly transitioned to equivalent lower-cost ROM parts for mass production.

The Z8 low voltage devices can operate as low as 2 volts and feature up to 32 GPIO, up to 4 KB of ROM, up to two 8-bit timers and available analog comparators.

The Z8 ROMless products feature up to 32 GPIO, up to 6 vectored interrupts, two 8-bit timers, analog comparators and various communication interfaces (UARTs, etc.).

The Classic family also features Zilog's Z8 GP (General-Purpose) series of devices, which offer up to 237 bytes of general-purpose RAM and up to 32KB of OTP memory. The low-voltage Z8 GP series supports voltage ranges from 2.0 V to 3.6 V, making it perfect for low-power applications. The high-voltage series supports voltage ranges from 2.0 V to 5.5 V.

FEATURES & BENEFITS

- Any Register-to-Any Register architecture avoids accumulator bottlenecks and is more code efficient than RISC processors
- Low-EMI Operation—Mode is programmable via software or as a mask option
- Re-locatable stack, only limited in size by total RAM space
- Larger RAM spaces improve ease of code generation, cutting development time
- Full tool support with a range of cross assemblers, C-Compilers, ICEBOX emulators, single and gang OTP/EPROM programmers and software simulators

Z8® Microcontrollers
Z8® Microcontrollers

TECHNICAL SPECS

- 8Mhz to 33Mhz optimized Z8® CPU core
- Flexible I/O—I/O byte, nibble and/or bit programmable as inputs or outputs
- Analog Inputs—three input pins are software programmable as digital or analog inputs
- Up to six vectored interrupt sources with software programmability
- Multiple timers on most devices, with flexible clocking and interrupt modes for simpler software solutions

AVAILABILITY

AVAILABLE NOW. Contact your local Zilog distributor, or visit our website at www.zilog.com to find a sales office nearest you.

APPLICATION AREAS

Consumer Appliances, Toys, Health & Fitness, After-Market Automotive, Security, HVAC, and Personal Electronic Devices.

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eZ80AcclaimPlus!™ Ethernet Flash Microcontrollers

Supported Operating Systems: Any

Supported 8-bit Architectures: Z80®/eZ80®

The eZ80AcclaimPlus!™ Ethernet Connectivity MCU is the latest in the award-winning eZ80Acclaim!® product family that integrates a high-performance 50 MHz Flash MCU core with a fast 10/100 Base-T Ethernet MAC. Adding to the existing eZ80Acclaim! feature set, the eZ80AcclaimPlus! touts an updated embedded internet software suite (ZTP) and an additional 10 percent system performance boost that equates to faster program execution and smaller memory space requirements over the current eZ80Acclaim! family.

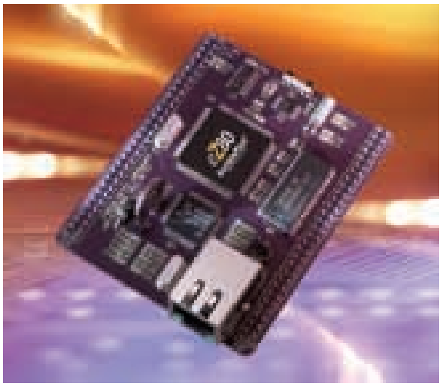
The eZ80AcclaimPlus! Flash MCU can operate in full 24-bit mode addressing 16 MB linearly WITHOUT a Memory Management Unit (MMU). Additionally, support for the Z80® compatible mode allows Z80®/Z180 customers to execute legacy code within multiple 64KB memory blocks with little modification. With an external bus supporting eZ80®, Z80®, Intel and Motorola bus modes, designers have several options when interfacing to external devices.

These high performance 8-bit Flash microcontrollers also offer a rich set of serial communication peripherals supporting legacy interfaces and are equipped with an IrDA EnDec that facilitates wireless data transfer. The award-winning eZ80F91 represents the world's first 8-bit MCU with Flash and Ethernet integration.

The family also features a line of semi-customizable, single-board computers (SBCs) named Zdots™, offering an on-board PHY and rich peripherals that form a unique drop-in solution to any design. Combined with one of the strongest tool offerings in the market, supporting a FREE full-version ANSI C-Compiler, RTOS and TCP/IP stack with every kit, the eZ80Acclaim!® Series is hard to beat when it comes to overall value and design flexibility.

FEATURES & BENEFITS

- 10/100 Mbps Ethernet with MII Interface to PHY Devices
- Zdots™ Single-Board Computers (SBCs)
- Faster program execution and smaller memory space requirements over the current eZ80Acclaim!® family
- Complete Embedded Internet Software Suite w/ Flexible/Configurable TCP/IP Stack
- Z80®/Z180 Legacy Upgrade Path



TECHNICAL SPECS

- 50 MHz high-performance eZ80® CPU core
- 256 KB Flash Memory/4-16 KB High-Speed SRAM
- 24-Bit Addressing without a Memory Management Unit (MMU)
- 32 GPIOs, 2 UARTs, SPI, I^{2}C, IrDA, WDT, RTC, and Capture/Compare/PWM
- JTAG, Low-power PLL and 32 KHz on-chip oscillator

AVAILABILITY

AVAILABLE NOW. Contact your local Zilog distributor, or visit our website at www.zilog.com to find a sales office nearest you.

APPLICATION AREAS

Embedded Networking, Remote Monitoring and Control, Communications, Industrial Control, Security, Vending, Point-of-Sale, Automation and Home Connectivity, and IP appliances.

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Zilog, Inc.

Z8 Encore!® Flash Microcontrollers

Supported Operating Systems: Any

Supported 8-bit Architectures: Zilog Z8®/eZ8™

The Z8 Encore!® family of Flash microcontrollers is comprised of two main device series – the F0830 and F083A. Developed around the highly-acclaimed eZ8 core, the devices feature key peripherals that are tied together to offer a complete solution with greater scalability, lower overall system cost and reduced energy consumption.

Both the F0830 and F083A Series of devices share similar features, and offer a full line of products that are selectable by memory size, EEPROM and ADC speed. The F083A, by contrast, extends the solution from the existing F0830 series and adds substantial cost-to-performance improvements for fan and motor control applications with a 2.8 ms ADC conversion time and a 20 MHz internal precision oscillator.

Common features available to both the F0830 and F083A devices include direct memory-to-memory arithmetic operation, a flexible Internal Precision Oscillator (IPO) and a best-in-class fast ADC. If your solution requires even more precision, the F083A takes all the performance and key peripheral features of the F0830 and adds to it a more optimized peripheral set specifically catered to applications that require faster response times. The F083A enhanced peripheral set enables critical motor control loop operations, for example, that accommodate for features such as current and temperature monitoring.

The entire family of Z8 Encore! parts is supported by one of the most comprehensive tool offerings in the market. Each development kit provides all the necessary hardware and software tools, including a FREE full-version ANSI C-Compiler and software sample libraries.

FEATURES & BENEFITS

- High-Performance 20MHz eZ8® CPU Core
- Up to 12 KB of Flash/ROM
- Up to 256 B of SRAM
- Up to 100 B of EEPROM Capability
- Single-Pin, On-chip Debugger

Flash
Flash
Z8 Encore!
Flash Microcontrollers
Enter
Flash
Flash

TECHNICAL SPECS

- Up to 8-channels, 10-bit SAR A/D Converter
- Up to 256 B of register RAM
- Fast Internal Precision Oscillator
- On-chip analog comparator
- Two 16-bit Timers with PWM Capability

AVAILABILITY

AVAILABLE NOW. Contact your local Zilog distributor, or visit our website at www.zilog.com to find a sales office nearest you.

APPLICATION AREAS

Motor Control, Power Management, Electric Fan Control, Sensor Interfacing, Ballast Control, Battery Charging, Security Systems, Home Appliances, and Personal Electronic Devices.

CONTACT INFORMATION

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Z8 Encore! XP® Flash Microcontrollers

Supported Operating Systems: Any

Supported 8-bit Architectures: Zilog Z8®/eZ8™

Hailed by design engineers as one of the most flexible architectures in the market today, Zilog has continued its tradition by eXPanding its current Z8 Encore!® 8-bit Microcontroller line with its Z8 Encore! XP® family of Flash Microcontrollers.

The Z8 Encore! XP® family provides a rich offering of Flash memory and a broad set of on-chip peripherals. Combined with Zilog's modified Harvard memory-to-memory-based architecture and one of the strongest tool offerings in the market with a FREE full-version ANSI C-Compiler, product designers are now putting this unprecedented horsepower to use in all their embedded applications.

With up to 64KB of Flash and up to 4 KB of SRAM, the Z8 Encore! XP® MCUs provide some unique features not available in the first generation of Z8 Encore!® parts, including an on-chip analog temperature sensor, an analog comparator and an analog transimpedance amplifier. Contributing to this highly integrated design is also an 8-channel, 10-bit A/D converter, a single-pin on-chip debugger, up to 18 interrupts and up to 25 general-purpose I/O pins.

Recently added to the Z8 Encore! XP family is Zilog's new F1680 – an optimized 1.8 V, low-power Flash MCU with program RAM. The F1680 Series ties together key peripherals to offer a perfect solution for those looking for a device that can accommodate such features as capacitive and resistive sensing, touch screen functionality, backlit control, panel control and temperature compensation. Additionally, the F1680 Series incorporates a best-in-class feature set that is optimized for steppermotor/microstepping control.

FEATURES & BENEFITS

- 20MHz eZ8™ CPU Core
- On-chip Temperature Sensor
- 1-64 KB of Flash Memory w/ In-Circuit Programming
- High resolution 10-bit Analog-to-Digital Converter (ADC)
- Single-Pin, On-Chip Debugger

SECURITY
LCD DISPLAYS
SAFETY
Z8 Encore! XP
Flash Microcontrollers
F1680
ZiLOG
PANELS
METERING
BATTERY CHARGIN

TECHNICAL SPECS

- Internal Precision Oscillator
- Analog Comparator
- UARTs, SPI and I^{2}C
- Transimpedance (Current Sense) Amplifier
- Up to 128 B of EEPROM capability

AVAILABILITY

AVAILABLE NOW. Contact your local Zilog distributor, or visit our website at www.zilog.com to find a sales office nearest you.

APPLICATION AREAS

Motor Control, Power Management, Intelligent Cooling, Battery Charging, Security Systems, Home Appliances, Personal Electronic Devices, and Sensor Interfacing.

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Microchip Technology Inc.

PICkit™ 3 Debug Express Kit

Supported 8-bit Architectures: PIC® Microcontrollers

The PICkit™ 3 Debug Express Kit (Part # DV164131) provides higher performance for Microchip's most popular low-cost development platform. Overcoming the cost and complexity barriers to enter the world of code development and embedded programming, the kit is priced at just $69.99.

The PICkit 3 Debug Express works with 8- and 16-bit PIC® microcontrollers (MCUs) and dsPIC® Digital Signal Controllers (DSCs), and is expected to support 32-bit PIC MCUs at a later date. Support for new PIC MCUs and DSCs, as well as the PIC32 MCUs, will be available as free firmware upgrades in future releases of the MPLAB® IDE.

The PICkit 3 Debug Express Kit makes it easy to explore the world of embedded control and to learn quickly, using the free MPLAB Integrated Development Environment. Connected to and powered by any personal computer via USB, the plug-and-play kit provides in-circuit debugging functions such as halt, single step, breakpoint on data or address, and a stopwatch for measuring target application performance. It can supply target power to the 44-pin demo board, hence no external power is required.

Additionally, with a 6-pin In-Circuit Serial Programming™ connector similar to that on the PICkit 2 Debug Express, the PICkit 3 probe is compatible with PICkit 2 demo kits and with Microchip's MPLAB ICD 2 and 3-compatible demonstration/evaluation kits using an optional RJ-11 to ICSP adapter (Part # AC164110).

MPLAB® IDE
PICkit™ 3 Debug Express
(Part # DV164131)

FEATURES & BENEFITS

- PICkit 3 debugger and programmer probe
- A 44-pin demo board populated with a PIC18F45K20 MCU
- Free version of the MPLAB C Compiler for PIC18 MCUs
- Easy-to-understand lessons and tutorials
- Host of other software utilities, examples with source code and full documentation

AVAILABILITY

Now. For further information, contact any Microchip sales representative or authorized worldwide distributor, or visit Microchip's Web site at *http://www.microchip.com.*

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MPLAB® ICD 3 In-Circuit Debugger

Supported 8-bit Architectures: PIC® Microcontrollers

The MPLAB® ICD 3 is a cost-effective, high-speed development tool that supports in-circuit programming and debugging of Microchip's Flash-based 8-bit PIC® microcontrollers (MCUs), and its entire line of 16- and 32-bit MCUs and 16-bit dsPIC® Digital Signal Controllers (DSCs). With robust system capabilities and high-speed circuitry, the MPLAB ICD 3 offers full compatibility with the MPLAB Integrated Development Environment (IDE), exceptional programming speed and reliability.

As escalating microcontroller speeds quickly outpace traditional in-circuit emulating capabilities, the MPLAB ICD 3 in-circuit debugger is designed to fill the need among embedded systems designers for premium performance. Flash MCU programming times are 15x or faster than the current generation. Improved speeds and features allow the design and debugging process to proceed quickly and efficiently.

Maintaining backward compatibility with Microchip's RJ-11 interface, the MPLAB ICD 3 can easily connect to target boards for quick device programming. Further, by integrating this new tool with the free and feature-rich MPLAB IDE, Microchip provides design engineers with a familiar development environment. This integration also serves to shorten the learning curve as customers move up or down the 500-strong PIC MCU and dsPIC DSC devices to find the best device for their application.

MPLAB
ICD 3
Microchip

MPLAB® ICD 3
(Part # DV164036)

FEATURES & BENEFITS

- Up to 1,000 software breakpoints
- 2 to 5.5 volt operation; 100 mA of target power support
- A ruggedized target interface for increased protection from over-voltage and over-current
- Internal memory for program storage
- Shipped with Test Interface Module, RJ-11 and USB 2.0 cables, CD containing the MPLAB IDE and full documentation and a Reference poster.

AVAILABILITY

Now. For further information, contact any Microchip sales representative or authorized worldwide distributor, or visit Microchip's Web site at *http://www.microchip.com*.

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www.microchip.com

IAR EMBEDDED WORKBENCH V7.50 FOR 8051

Supported 8-bit Architectures: All chips with 8051, 8052 and some extended architectures

IAR Embedded Workbench for 8051 provides extensive support for a wide range of 8051 devices and generates very compact and efficient code. Ready-made example projects and built-in plug-ins to various hardware debug systems are included in standard edition.

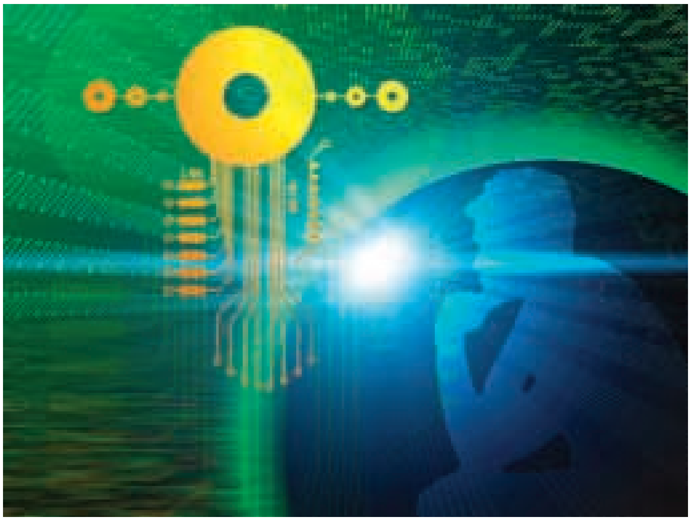
Highlights in version 7.50

- New and improved hardware debugging support
- New device support
- Multi-file compilation
- Build integration with IAR visualSTATE

We continuously add hardware debugging support for new devices—please contact IAR Systems to find out whether your new device is already supported or when it will become available.

FEATURES & BENEFITS

- Integrated development environment with project management tools and editor
- Highly optimizing 8051 compiler supporting C and C++
- Configuration files for 8051 devices from different manufacturers
- Run-time libraries with complete source code
- Relocating 8051 assembler
- Linker and librarian tools
- C-SPY debugger with 8051 simulator and support for RTOS-aware debugging on hardware
- ROM-monitor and JTAG drivers as well as source code and project for creating your own ROM-monitor driver
- Example projects for 8051 and code templates
- User and reference guides, both printed and in PDF format
- Context-sensitive online help



TECHNICAL SPECS

- Support for DATA, IDATA, XDATA, PDATA and BDATA
- Support for multiple DPTR in compiler and libraries
- Bitwise addressing for SFRs
- Possibility to use up to 32 virtual registers
- Configurable IAR ROM-monitor for the NXP LPC935 and TI MSC1211
- Analog Devices ROM-monitor for the Analog Devices ADu83x, ADu84x and ADE7169F16 devices
- Chipcon JTAG interface for the Chipcon CC2430 SoC ZigBee development kit
- Infineon Debug Access Server (DAS) for the Infineon XC8xx device family
- Manley Electronics ME52HU emulator
- Silicon Laboratories USB and serial (EC2) JTAG adapters
- A generic IAR ROM-monitor project template is included for configuration of additional 8051 boards and kits

CONTACT INFORMATION

IAR SYSTEMS

IAR Systems Software, Inc.
http://www.iar.com
650-287-4250 Tel
650-287-4253 Fax
Foster City, CA USA

IAR Embedded

IAR KICKSTART KIT FOR SL-F34X

Supported 8-bit Architectures: All chips with 8051, 8052 and some extended architectures

IAR KickStart Kit for SL-F34X contains all the necessary hardware and software and allows you to design, develop, integrate and test your applications:

- C8051F340 development board from Silicon Laboratories
- IAR visualSTATE evaluation edition
- IAR Embedded Workbench for 8051 4K limited edition
- IAR Embedded Workbench for 8051 example applications made for the evaluation board

Features of the C8051D340 evaluation board from Silicon Laboratories

The C8051F34x Development Kit includes a target board with a C8051F340 device pre-installed for evaluation and preliminary software development. Numerous input/output (I/O) connections are provided to facilitate prototyping.

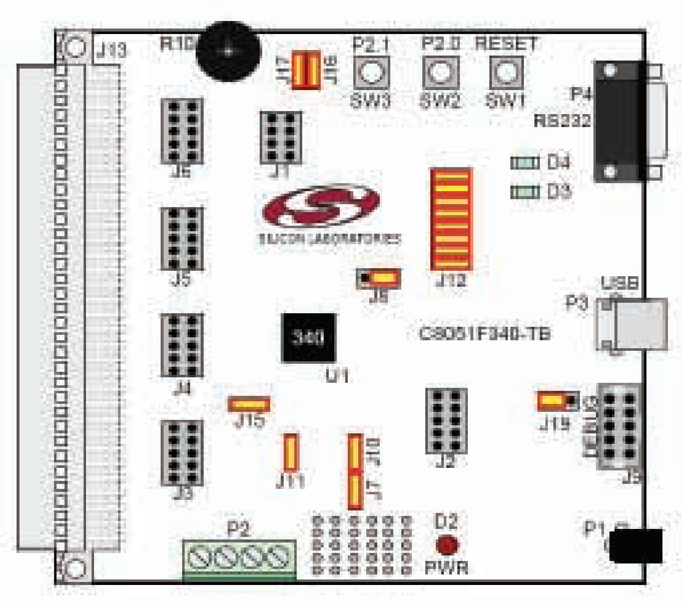
IAR VISUALSTATE

State machine design, test and implementation tools
IAR visualSTATE is a set of highly sophisticated and easy-to-use development tools for designing, testing and implementing embedded applications based on state machines.

It provides advanced verification and validation utilities and generates very compact C/C++ code that is 100% consistent with your system design. In addition, the new and revolutionizing integration with IAR Embedded Workbench, a fully integrated C/C++ compiler and debugger toolset, enables true state machine debugging on hardware—get direct graphical feedback on various levels of detail.

Highlights in version 6.2

- Possibility to exclude design regions from code generation
- Verificator enhancements
- Readable code MISRA C 2004 updates
- Comprehensive example code index
- Updated user guides



FEATURES & BENEFITS

◆ Completely integrated development environment including a graphical designer, test tools, a code generator, and a documentation facility.
◆ Graphical state machine design based on the Unified Modeling Language (UML) state machine subset
◆ Formal verification of the design model to find unwanted properties in the design, like dead-ends or unreachable states etc.
◆ Test and validation tools to ensure at an early stage of design that the application behaves as expected, even before the hardware exists.
◆ Automatic code generation providing very compact C/C++ code, 100% compliant with the design.
◆ Automatic documentation generation with comprehensive information.
◆ Tightly integrated with IAR Embedded Workbench, ready-made project examples for various microcontrollers and evaluation boards.

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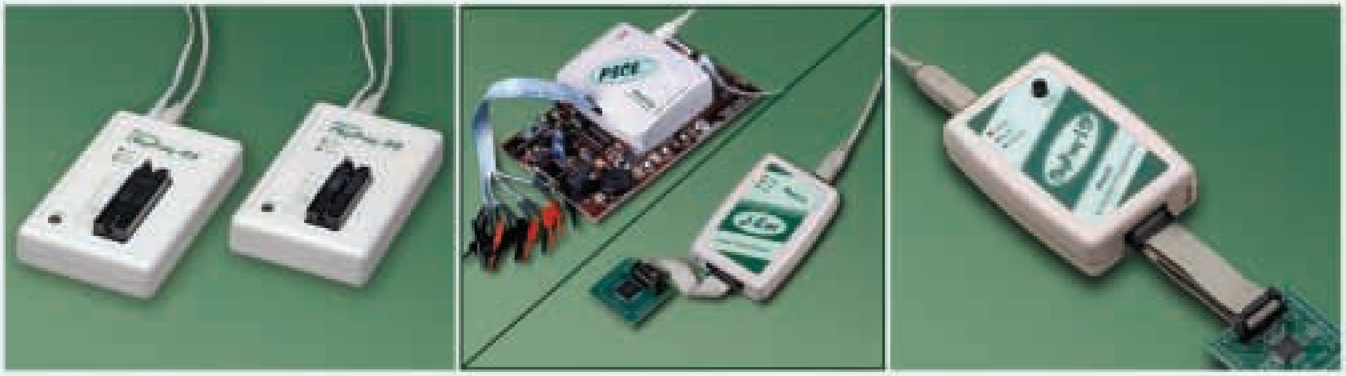

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